CLAIMS

1. A polishing composition for polishing a metal film provided on a substrate having trenches such that the metal film fills the trenches, so as to provide a planarized surface, wherein the composition comprises water, a phosphate ester having a C≥6 carbon atom alkyl group in its molecule, and an etchant for the metal, and has a pH of 5 to 11.

2. The polishing composition according to claim 1, wherein said phosphate ester is a phosphate ester having a C6 to C22 alkyl group in its molecule.

3. The polishing composition according to claim 1 or 2, wherein the content of said phosphate ester is in a range of 0.0001 to 2 mass %.

4. The polishing composition according to any one of 1 to 3, wherein said etchant comprises an acid and/or a base, and an oxidizing agent.

5. The polishing composition according to claim 4, wherein the content of said an acid and/or a base is in range of 0.01 to 10 mass%.

6. The polishing composition according to claim 4, wherein the content of said oxidizing agent is in range of 0.01 to 30 mass%.

7. The polishing composition according to any one of 1 to 6, which further comprises abrasive.

8. The polishing composition according to claim 7, wherein the content of said abrasive is in range of 30 mass% or less.

9. The polishing composition according to any one of claims 1 to 8, which further comprises a surfactant.

10. The polishing composition according to claim 9, wherein the content of said surfactant is in range of 5 mass% or less.

11. The polishing composition according to any one of claims 1 to 10, which further comprises a compound having two or more azole moieties in its molecule.

12. The polishing composition according to claim

11, wherein the content of said compound having two or more azole moieties in its molecule is in range of 0.001 to 1 mass%.

13. The polishing composition according to any one of claims 1 to 12, which further comprises an amino acid.

14. The polishing composition according to claim 13, wherein the content of said amino acid is in range of 0.001 to 10 mass%.

15. The polishing composition according to any one of claims 1 to 14, which further comprises a compound having one azole moiety in its molecule.

16. The polishing composition according to claim 15, wherein the content of said compound having one azole moiety in its molecule is in range of 0.001 to 5 mass%.

17. The polishing composition according to any one of claims 1 to 16, which further comprises a fatty acid having a six or more carbon atom alkyl group in its molecule.

18. The polishing composition according to claim 17, wherein the content of said fatty acid having a C≥6 carbon atom alkyl group in its molecule is in range of 0.001 to 5 mass%.

19. The polishing composition according to any one of claims 4 to 18, where said acid is an inorganic acid or carboxylic acid.

20. The polishing composition according to claim 19, wherein said inorganic acids is at least one species selected from the group consisting of sulfuric acid, phosphoric acid, phosphonic acid, and nitric acid.

21. The polishing composition according to claim 19, wherein said carboxylic acids is at least one species selected from the group consisting of formic acid, acetic acid, propionic acid, butyric acid, valeric acid, 2-methylburyric acid, n-hexanoic acid, 3,3-dimethylbutyric acid, 2-ethylbutyric acid, 4-methylpentanoic acid, n-heptanoic acid, 2-methylhexanoic acid, n-octanoic acid, 2-ethylhexanoic acid, benzoic acid, glycolic acid

(hydroxyacetic acid), salicylic acid, glyceric acid, oxalic acid, malonic acid, succinic acid, glutaric acid, adipic acid, pimelic acid, maleic acid, phthalic acid, malic acid, tartaric acid, citric acid, lactic acid, nicotic acid, quinaldinic acid, and anthranilic acid.

22. The polishing composition according to any one of claims 1 to 21, wherein said base is at least one species selected from the group consisting of ammonia; sodium hydroxide; potassium hydroxide; potassium carbonate; potassium hydrogencarbonate; ammonium hydrogencarbonate; alkylmonoamines; allylamine; 2-ethylhexylamine; cyclohexylamine, benzylamine, and furfurylamine; monoamines having a hydroxyl group; diamines; and polyamines.

23. The polishing composition according to any one of claims 4 to 22, wherein said oxidizing agent is at least one species selected from the group consisting of oxygen, hydrogen peroxide, ozone, alkyl peroxides, peracids, permanganate salts, persulfate salts, polyoxo acids, hypochlorite salts, and periodate salts.

24. The polishing composition according to any one of claims 8 to 23, wherein said abrasive is formed of at least one species selected from the group consisting of silica, cerium oxide, aluminum oxide, aluminum hydroxide, titanium dioxide, and organic abrasive.

25. The polishing composition according to any one of claims 10 to 24, wherein said surfactant is at least one species selected from the group consisting of anionic surfactants, cationic surfactants, nonionic surfactants, and ampholytic surfactants.

26. The polishing composition according to any one of claims 10 to 25, wherein said surfactant is an alkylaromatic-sulfonic acid or a salt thereof.

27. The polishing composition according to any one of claims 12 to 26, wherein said compound having two or more azole moieties in its molecule is an azole polymer having a vinyl group.

28. The polishing composition according to claim 12 to 27, wherein said compound having two or more azole moieties in its molecule is a polymer having a mass average molecular mass of 2,000 to 500,000.

29. The polishing composition according to any one of claims 13 to 28, wherein said amino acid is at least one species selected from the group consisting of glycine, alanine, β-alanine, 2-aminobutyric acid, norvaline, valine, leucine, norleucine, isoleucine, allo-isoleucine, phenylalanine, proline, sarcosine, ornithine, lysine, taurine, serine, threonine, allo-threonine, homoserine, tyrosine, 3,5-diiodo-tyrosine, β-(3,4-dihydroxyphenyl)-alanine, thyroxine, 4-hydroxy-proline, cysteine, methionine, ethionine, lanthionine, cystathionine, cystine, cysteic acid, aspartic acid, glutamic acid, S-(carboxymethyl)-cysteine, 4-aminobutyric acid, asparagine, glutamine, azaserine, arginine, canavanine, citrulline, δ-hydroxy-lysine, creatine, kynurenine, histidine, 1-methyl-histidine, 3-methyl-histidine, ergothioneine, and tryptophan.

30. The polishing composition according to any one of claims 15 to 29, wherein said compound having one azole moiety in its molecule is at least one species selected from the group consisting of benzimidazole-2-thiol, 2-[2-(benzothiazolyl)]thiopropionic acid, 2-[2-(benzothiazolyl)]thiobutyric acid, 2-mercaptobenzothiazole, 1,2,3-triazole, 1,2,4-triazole, 3-amino-1H-1,2,4-triazole, benzotriazole, 1-hydroxybenzotriazole, 1-dihydroxypropylbenzotriazole, 2,3-dicarboxypropylbenzotriazole, 4-hydroxybenzotriazole, 4-carboxyl-1H-benzotriazole, 4-methoxycarbonyl-1H-benzotriazole, 4-butoxycarbonyl-1H-benzotriazole, 4-octyloxycarbonyl-1H-benzotriazole, 5-hexylbenzotriazole, N-(1,2,3-benzotriazolyl-1-methyl)-N-(1,2,4-triazolyl-1-methyl)-2-ethylhexylamine, tolyltriazole, naphthotriazole, benzimidazole, tetrazole,

hydroxybenzotriazole, and carboxybenzotriazole.

31. A composition which forms the polishing composition as set forth in any one of claims 1 to 30 by dilution.

32. A kit comprising a plurality of compositions, which forms the polishing composition as set forth in any one of claims 1 to 30 by (i) mixing or (ii) mixing and diluting said plurality of compositions.

33. A polishing method, characterized by comprising polishing, by use of the polishing composition as recited in any one of Claims 1 to 30, a metal film provided on a substrate having trenches such that the metal film fills the trenches so as to provide a planarized surface.

34. The polishing composition according to claim 33, wherein said metal film is of copper or an alloy containing copper.

35. The polishing composition according to claim 34, wherein said metal film is stacked with at least two layers: a barrier layer and a metal wiring layer.

36. The polishing composition according to claim 35, wherein said barrier layer is formed of at least one species selected from the group consisting of tantalum, tantalum alloy, tantalum nitride, titanium, and titanium alloy.

37. A method for using the composition as set forth in claim 31.

38. A method for using the kit as set forth in claim 32 as a composition for transportation or storage.